DOCUMENT RESUME

ED 370 993 TM 021 589

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TITLE Frame of Reference Theory of Self-Concept Formation with Academically-Able Students.
PUB DATE Apr 94
NOTE 20p.; Paper presented at the Annual Meeting of the American Educational Research Association (New Orleans, LA, April 4-8, 1994).
PUB TYPE Reports - Research/Technical (143) -- Speeches/Conference Papers (150)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Academic Achievement; Comparative Analysis; *Concept Formation; *Gifted; High Schools; High School Students; Path Analysis; Peer Evaluation; *Self Concept; Sex Differences; Student Placement
IDENTIFIERS Academic Self Concept; *Frame of Reference Model; Internal External Frame of Reference Model

ABSTRACT

Frame of reference theory (Marsh, 1990) proclaims that students make both internal ability comparisons across academic domains and external ability comparisons relative to peers in determining academic self-concept. The validation of this theory with academically able students seems crucial to their appropriate placement in specialized program options. Verbal and mathematics self-concept and achievement measures were administered to 103 academically able high school students. Path analyses verified the dual influence of both internal and external processes on overall student self-concepts. Gender difference analyses indicated that whereas males may tend toward making external comparisons, the internal comparison process may be stronger for females. (Contains 24 references, 1 table and 3 figures.) (Author)

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Frame of Reference Theory of Self-Concept Formation with Academically-Able Students

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Presented at the annual meeting of the American Educational Research Association

New Orleans, LA

April, 1994

TM021589

Abstract

Frame of reference theory (Marsh, 1990) proclaims that students make both internal ability comparisons across academic domains and external ability comparisons relative to peers indetermining academic self-concept. The validation of this theory with academically-able students seems crucial to their appropriate placement in specialized program options. Verbal and mathematics self-concept and achievement measures were administered to 103 academically able-high school students. Path analyses verified the dual influence of both internal and external processes on overall student self-concepts. Gender difference analyses indicated that whereas males may tend toward making external comparisons, the internal comparison process may be stronger for females.

FRAME OF REFERENCE THEORY OF SELF-CONCEPT FORMATION WITH ACADEMICALLY-ABLE STUDENTS

Self-concept has long been thought an important variable to understand relative to educational programs, particularly specialized programs for gifted students (Kolloff & Feldhusen, 1984). A realistic and healthy conception of self has been identified as crucial to the realization of potential for gifted students (Whitmore, 1980), and an important objective of educators of gifted children (Feldhusen, 1986). Although many researchers have documented self-concept of gifted students as positively advantaged over their non-gifted peers (Coleman & Fults, 1982; Karnes & Wherry, 1981; Kelly & Colangelo, 1985), these differences are less stable when gender comparisons are made (Loeb & Jay, 1987).

Efforts to determine the relationship between self-concept and academic achievement for the gifted student have often been restricted to assessing global self-concept (e.g., Kulik, 1985; Schneider, et al., 1989), or the belief one has about one's general ability relative to school performance. This overall association of self-concept to academic achievement appears to make intuitive sense: the better one thinks one can do in school, the better one performs. On the other hand, current research with gifted students (e.g., Van Boxtel & Monks, 1992) indicates that multidimensional self-concept models (see Byrne & Shavelson,1986; Marsh & Shavelson, 1985) are necessary in differentiating the effects of achievement on self-concept. When this relationship is analytically explored within the context of specific subject perceptions, the association between achievement and self-concept does not appear to be so straightforward. For example, Marsh

(1990) found that self-concept in one academic subject may not be related to achievement in other areas. He formulated a "frame of reference" theory to explain such findings. The purpose of this study was to assess the applicability of the frame of reference theory with academically able students placed in honors classes.

Proponents of the internal/external frame of reference theory (e.g., Marsh, 1986; Marsh, Byrne, & Shavelson, 1988) believe that student academic self-concepts are determined in relation to both internal and external comparisons, or frames of reference. According to this theory, students concurrently compare both their individual academic achievements across subject areas (internal comparisons), and their overall ability level relative to others within their learning environment (external comparisons). For example, an internal comparison is the perception that one's performance is better in mathematics than language, thus this student exhibits higher mathematics self-concept. An external comparison refers to the belief that one's mathematics performance is better than other students in the mathematics class, and subsequently, this student report high mathematics self-concept.

The theoretical model developed to explain the theory (see Marsh, 1990) predicts a high positive correlation between verbal and mathematics achievement, significant positive direct effects for both verbal achievement on verbal self-concept, and for mathematics achievement on mathematics self-concept. The impact of verbal achievement on mathematics self-concept, and mathematics achievement on verbal self-concept is assumed to be low and negative. Finally, the relationship between verbal and mathematics self-concepts are specified to be approximately zero.

Thus the frame of reference theory conceptualizes the nature of the comparisons made by students in formulating their academic self-concepts in relation to performance. Students are believed to be influenced both by an internal comparison of performance across academic areas, and an external comparison of performance relative to other students within their frame of reference (or particular learning environment). Although the internal/external process posited in the frame of reference theory has been supported through research using average-ability students, the model has apparently not been examined with high-ability students. Marsh (1987) has concluded that equally able students have lower academic self-concepts in high-ability schools than in low-ability schools. Apparently, environment and ability grouping patterns play a role in how students determine their academic self-concepts. Additionally, documented gender differences amonggifted students (e.g., Callahan, 1991) suggest that the frame of reference theory may differentially impact males and females.

Method

Participants

The student sample (N = 103) included primarily (98%) ninth-graders attending honors courses in an Oklahoma suburban public school. The majority of the participants were white, middle to upper-middle class students nominated by parents or teachers for placement in the honors science program. High achievement scores (85th percentile) in any area could be used as support for program placement, but were not the sole criterion. The program expanded the

regular academic curriculum in science to include greater abstraction and complexity, critical thinking and problem solving within the context of experimentation and discussion.

Procedure and Measures

All students voluntarily completed a self-report instrument during their honors physical science class. The questionnaire contained two counterbalanced components which measured verbal and mathematics self-concept. In addition, gender and achievement test scores (Iowa Tests of Basic Skills, 1986 [ITBS]) were obtained for each student from school records. The ITBS scores (Level 14 - Form G) used in this study included both standardized language total (containing measures of spelling, capitalization, punctuation, usage and expression) and mathematics total (consisting of concepts, problems, and computation).

The ME: Self-Concept Scale for Gifted Children is a self-report questionnaire used to assess students' perceptions of academic self-concept (Feldhusen & Kolloff, 1981). This instrument was specifically developed to assess the perceptions of academically-able children concerning their academic abilities, strengths, and talents. The ME self-concept scale is considered to be a reliable and valid research measure of the academic self-concept of bright students (Feldhusen, Sayler, Nielsen, & Kolloff, 1990).

The 40-item ME scale was adapted for use in the current study to allow for an assessment of self-concept in the language and mathematics content domains. Five of the original ME items cited abilities unrelated to either the language or mathematics areas. These items, such as "I can draw well", were deleted from the questionnaire. Items on the remaining original 35-item test

were then altered to direct students' attention to mathematics, and then to language or English. For example, the statement "I am smart" became "I am smart in English" or "I am smart in Math." "I do well on tests" became "I do well on Math tests" and "I do well on English" tests. Students responsed to the final 35-item domain-specific self-concept scales by either agreeing or disagreeing with each statement. Possible scores ranged from 0 to 35, with one point given for each item of agreement. Thus higher scores indicated higher perceived language/verbal or mathematics self-concept. Coefficient alpha estimates calculated on the student sample for each modified self-concept scale revealed good internal consistency reliabilities (verbal = .854; mathematics = .855).

Results

Empirical Support for the Model

The theoretical linkage presumed to exist among the variables is graphically presented in Figure 1. This model was tested with conventional path analysis, which is used to estimate model parameters via a series of multiple regressions (Pedhazur, 1982). The path diagram shown in Figure 1 contains the estimated path coefficients (standardized regression coefficients), presented along the unidirectional arrows. The relative size of each coefficient is indicative of that variable's predictive importance in the model. Additionally, when a path coefficient is squared, this value represents the percentage of explained variance for each path. Bivariate correlations between the achievement and self-concept variables in the model are given in parentheses on the diagram.

Insert Figure 1 about here

As predicted, although a strong positive correlation was obtained between verbal and mathematics achievement, with about 49% of the variance shared, verbal and mathematics self-concepts were not significantly related ($r = .0295$). Significant positive effects of verbal achievement were anticipated and achieved on verbal self-concept, and mathematics achievement on mathematics self-concept. Verbal achievement had a negative effect on mathematics self-concept, and mathematics achievement had a negative effect on verbal self-concept. Thus, the parameter estimates derived in the path analysis and shown in Figure 1 indicated that the theory withstood the statistical test and was not disconfirmed. Apparently, as a group, it appeared that the academically-able students used both internal and external frames of reference in determining their academic self-concepts.

Gender Group Differences

To assess self-concept and achievement gender-related differences, two analyses of variance (ANOVAs) were conducted. In each analysis, gender served as the between variable, with the self-concept and then the achievement facets serving as respective repeated measures. Statistically significant ANOVA interaction effects indicated that both self-concept [$F(1,101) = 8.83$; $p = .003$] and achievement [$F(1,101) = 6.74$; $p = .011$] differed across the two content areas depending on gender. Predictably (see Table 1 for means and standard deviations), female

students scored significantly higher than males in verbal achievement. Interestingly, differences between mathematics scores were nonsignificant and appeared to be fairly consistent across the gender groups. In addition, although males and females did not appear to differ in their verbal self-concept, significant gender differences did exist in mathematics self-concept, with male perceptions higher than female perceptions.

Model Estimation by Gender

Based on the results of gender differences, separate path analyses were conducted with the male (N = 49) and female (N = 54) subsample data. It should be noted that these analyses were exploratory due to the low subsample sizes. The preliminary findings indicated that, for males, all patterns among the variables were in the theoretically expected direction (see Figure 2), except for two distinct parameter estimates.

Insert Figure 2 about here

Unexpected was the nonsignificant path coefficient representing the direct effect of verbal achievement on verbal self-concept. Additionally, mathematics achievement positively (rather than negatively) influenced verbal self-concept. The self-concept facets were significantly positively correlated, although only about 8% of the total variance was shared.

For females, the theoretically anticipated pattern of linkages among the variables was generally replicated (shown in Figure 3). However, although the theory specifies low, negative

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Insert Figure 3 about here

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effects of verbal achievement on mathematics self-concept, and of mathematics achievement on verbal self-concept, the path coefficients reached statistical significance (-.568 and -.498, respectively). A negative correlation was obtained between the self-concept facets for females, although only about 2% of the total variance was shared.

Discussion

Often thought to be advantaged in terms of self-concept, the findings presented here suggest that academically-able students may be at risk for unrealistic perceptions of academic ability relative to their actual performance. Similar to previous studies with the general population (see Marsh, 1990) and with the population of students who are gifted (see Van Boxtel & Monks, 1992), the present study supports the importance of examining academic self-concept using multiple dimensions. Furthermore, there is support in the literature (e.g., Benbow & Minor, 1990) for two distinct types of giftedness, verbal and mathematics.

Consistent with the frame of reference theory, the low or near-zero correlation of verbal to mathematics self-concept indicated that high ability students indeed used both internal and external references in formulating perceptions of academic self. The current study revealed that achievement in mathematics and verbal areas were highly correlated; whereas, academic self-concepts were not. Both perceptions of differential ability in mathematics or verbal areas

(internal), and ability differences among others in the class (external) appeared to impact the formulation of academic self-concept.

Regarding gender differences, females in this study tended to rely more on an internal frame of reference when determining their academic self-concepts. This was indicated by the low correlation between the self-concept facets coupled with the strong negative effects of verbal achievement on mathematics self-concept, and mathematics achievement on verbal self-concept. On the other hand, for males the positive impact of mathematics achievement on verbal self-concept and the positive relationship between the self-concept facets indicated that the external comparison process was stronger than the internal process.

These differences found between gender groups are contrary to Marsh's (1986) conclusion that the frame of reference theory appears to generalize across gender groups. The present study suggests that a potential cancellation effect may be occurring with able students. Combining male and female responses may have yielded the lack of association between the self-concept facets found when the gender groups were joined. It should be noted that this conclusion is extremely tentative due to the low subsample sizes, which may have influenced the size of the correlations reported here.

In conclusion, it seems imperative to continue to examine the pattern of self-concept to achievement relationships with homogeneously grouped male and female students across multiple academic domains. The results presented here suggest that a portion of the ability perceptions of academically-able students may be influenced by comparisons made both across academic areas

and relative to other peer-group students. Thus, although the frame of reference theory for able learners was generally validated, additional research is necessary to examine potential applications of this theory to male and female high achieving students.

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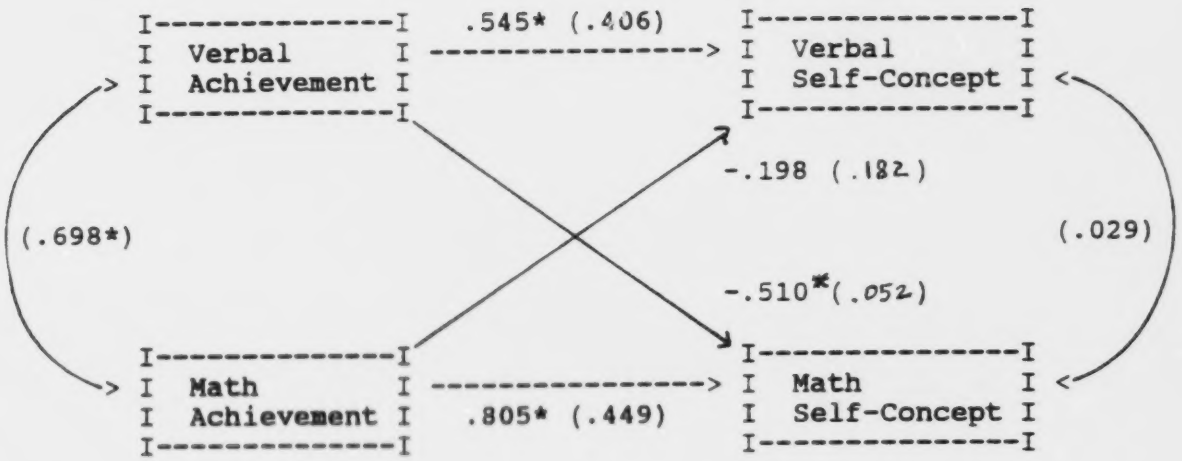
Table 1

Achievement and Self-Concept Descriptive Data by Gender.

	FEMALES (N = 54)		MALES (N = 49)	
	Mean	Standard Deviation	Mean	Standard Deviation
Verbal Achievement	86.30	13.30	82.27	17.67
Math Achievement	82.61	14.67	84.53	14.99
Verbal Self-Concept	23.91	5.81	21.96	6.39
Math Self-Concept	20.33	6.30	23.31	5.86

Figure 1

Full Sample Path Analysis

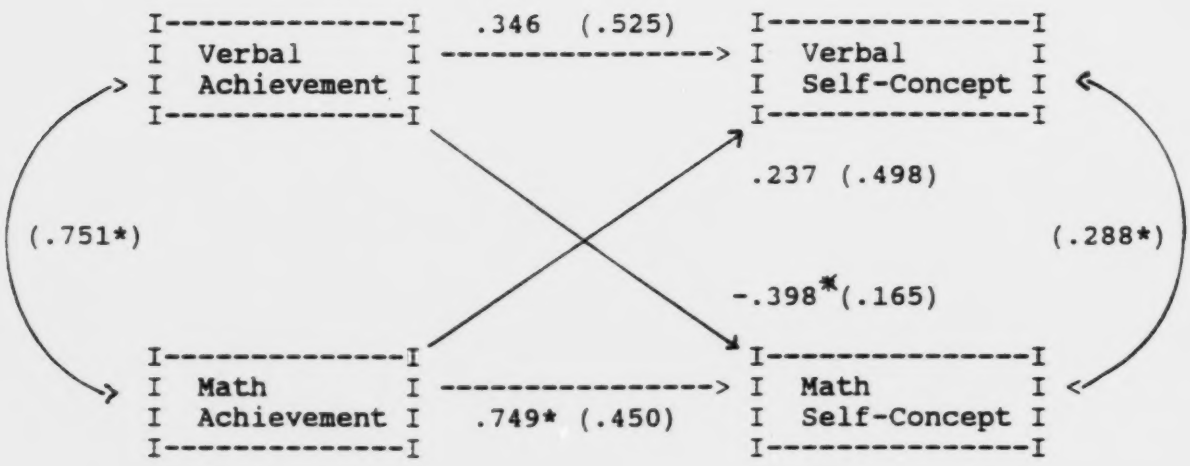


* $p < .05$

Note: Numbers on the arrows are standardized regression coefficients; the correlations are presented in parentheses.

Figure 2

Male (N = 49) path analyses

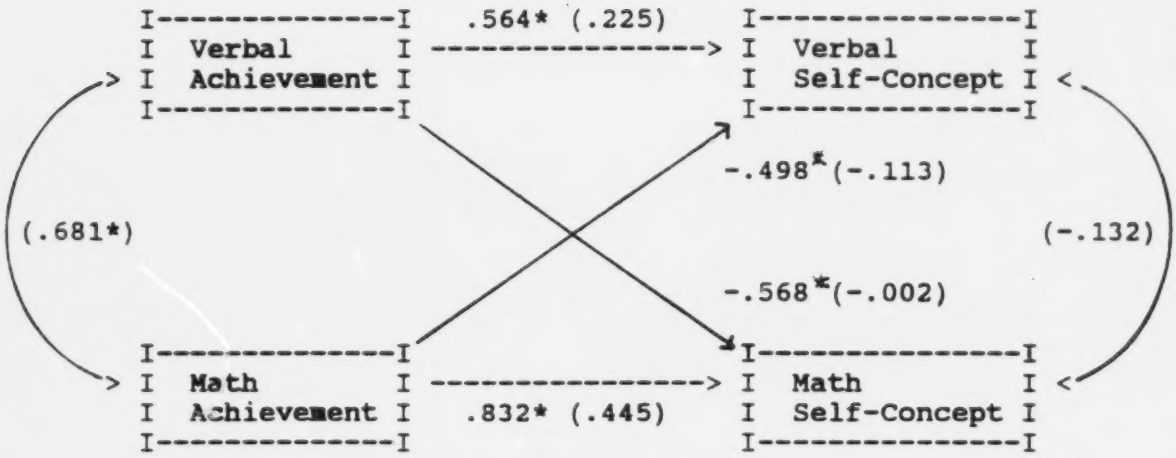


* $p < .05$

Note: Numbers on the arrows are standardized regression coefficients; the correlations are presented in parentheses.

Figure 3

Female (N = 53) path analyses



* $p < .05$

Note: Numbers on the arrows are standardized regression coefficients; the correlations are presented in parentheses.